

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

CONTENTS AND USE OF THE HOPKINS U. S. FILE SYSTEM

By

R. G. Mitchell, Entomologist

Division of Forest Insect Research
Pacific Northwest Forest and Range Experiment Station
Portland, Oregon
September 1961

This report is not for publication in whole or in part without prior approval
of the chief of this Bureau.

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
COMPONENT PARTS OF THE HOPKINS U. S. FILE SYSTEM	1
Number File	1
1. General Note Card	2
2. Rearing Notes Summary Card	3
3. Species Note Card	3
4. Species Summary Card	4
5. Species Determination Card	5
Host Index	5
Insect Species File	7
SEQUENCE OF EVENTS IN COLLECTING, PROCESSING, AND FILING	9
APPENDIX A	12

CONTENTS AND USE OF THE HOPKINS U.S. FILE SYSTEM

By
R. G. Mitchell

INTRODUCTION

At first exposure, the Hopkins U. S. file system appears to be a formidable and ridiculous obstacle standing between the entomologist and sorely needed insect determinations. However, as familiarity with the system develops, one finds the file of much practical value and not nearly as complicated as its appearance first suggests. The difficulty is getting started. The purpose of this report is to ease the pain of the initial plunge by (1) describing the component parts of the Hopkins U. S. file system, and (2) presenting a check list of steps in assigning Hopkins numbers, processing insect material, preparing file records, and obtaining insect identifications.

COMPONENT PARTS OF THE HOPKINS U. S. FILE SYSTEM

The Hopkins U. S. file is a Forest Service cross-index system designed to provide comprehensive, accurate records of insect-host relationships. The system was developed by A. D. Hopkins, the entomologist who first catalogued the important forest insects in the West. It has since been greatly modified and is now used principally in the West. The entire system is based on a series of numbers assigned in blocks to the various Stations by the Division of Forest Insect Research in Washington, D. C. These numbers are called "Hopkins Numbers". A Hopkins number refers to a specific collection from a particular host--a collection which may include one or several insect species. Only subsequent addition of a "letter" suffix (i.e., "A", "B", "C", etc.) narrows the reference to a single insect species.

The file is composed chiefly of note cards and preserved insects, although damage samples are often included. Photographs may also be referenced to the file. Insect specimens are numbered and may be pinned, kept in alcohol, or mounted on microscope slides. Related information, such as biological data, host records, etc., is kept in a card file. The card file has three major sections: (1) A number file, (2) a host index, and (3) an insect species file. Characteristics of files, and procedures of filing material after obtaining identifications are discussed below.

Number File

The number file is a repository for all insect collecting and rearing information. It is arranged numerically according to Hopkins number. Although the number file is a key index and the first file to be used when recording collection data, it is nevertheless the last file one

investigates when seeking information. The number file is reached after first obtaining a Hopkins number from the host index, the insect species file, the photograph file, or from the preserved specimens in the insect museum.

Five different types of cards may be used in the number file. Although these cards are usually clipped together to form a working unit, certain basic collecting data are placed on each card:

1. Hopkins U. S. number
2. Tree host
3. General locality (i.e., the nearest post office)
4. Date of collection
5. Collector

The names of the five cards in the number file and a description of the information to be placed on them (in addition to the above basic data) are given below:

1. General Note Card - This card is always required. It describes: (a) purpose of collection (curiosity or what); ^{1/} (b) conditions of collection (project or not); (c) method of collection; (d) locality of collection in detail (township, range, and section) and, if possible elevation; (e) comments on environment; and (f) condition of tree host and the parts affected. An example of a general note card is shown in Figure 1.

Figure 1.--Example of general note card

Hopk. U.S. <u>33500</u>		
<u>Abies amabilis</u> Enumclaw, Wash.	July 28, 1959	P. W. Orr, Col'r.
<p>While checking for black-headed budworm damage on Huckleberry Ridge on Snoqualmie N. F., sawfly feeding on old and new needles of silver fir was noted near Jim Creek (T.18 N, R.9 E; Sec.16 WM; elev., 3,500 ft.). The feeding was about equally severe on old and new needles. Disease appeared to have killed some larvae. Some larvae sent to Dr. A. E. Steinhaus for diagnosis. Diagnosis negative. 25 larvae placed in rearing July 30.</p>		

^{1/} Examples: Determination of insects associated with a type of damage; rearing of parasites from a known insect host; recording a tree host or locality for a known insect.

2. Rearing Notes Summary Card - This type of card is not needed if the insects were collected as adults. It notes the date insects were placed in rearing as well as the type of rearing container, and the number of insects reared. It includes parasites as well as phytophagous insects and is usually prepared in table form, although it can be in descriptive narrative. Figure 2 presents an example of the table form.

Figure 2.--Example of rearing summary card

Rearing Notes			Hopk. U.S. <u>33465</u>		
<u>Pinus ponderosa</u>					
Goldendale, Wash.		Aug. 6, 1957		W. H. Klein, Col'r.	
<u>Adult Emergence from Bark Samples</u>					
Date emerged	"A" Sawfly	"B" Ichn.	"C" Ichn.	"D" Chalcid	"E" Fly
4- 7-58	5	2	1	0	0
4-17-58	7	2	0	2	0
4-18-58	1	0	0	1	1
4-20-58	2	0	0	0	2
4-25-58	1	0	0	0	1
6- 1-58	0	0	0	0	0
Totals	16	4	1	3	4

3. Species Note Card - The use of this card is optional. It describes anything pertinent or peculiar about individual insect species; it may describe oviposition, flight, reaction to stimuli, or perhaps some singularly odd anatomical features that would distinguish the species. Figure 3 is an example of a species note card.

Figure 3.--Example of species note card

Hopk. U.S. <u>33,395-A</u>	
<u>Pseudotsuga menziesii</u> Baker, Ore.	July 10, 1957 V. M. Carolin, Col'r.
Species note - Description	
Full-grown larva - length 1-1/4 to 1-1/2 inches; head jet black, shield colorless and divided; body a mottled green, marked with 3 longitudinal white lines on dorsum and with a pale yellow spiracular stripe; conjunctivae yellow to pink; setal bases black and prominent - those on meso- and meta-thorax larger and raised.	

4. Species Summary Card - This card presents a tentative identification of insects collected. An assignment of a "letter" suffix to the Hopkins number is made for each species and the number of insects pinned or preserved is recorded. The summary is always required. An example of the card's format prior to receipt of determinations is shown in figure 4. Eventually final determinations are inserted over tentative identifications.

Figure 4.--Example of species summary card

Hopk. U.S. <u>30344</u>	
<u>Pseudotsuga taxifolia</u> Enumclaw, Wash.	July 28, 1959 P. W. Orr, Col'r.
A - Scolytidae, <u>Dendroctonus</u> sp. 10 pinned, 20 alc.	
B - Cerambycidae, <u>Monochamus</u> sp. 5 pinned	
C - Braconidae, <u>Coeloides</u> sp. 13 pinned	

5. Species Determination Card - Three identical cards are made for each insect species to be determined; the card tells the number of specimens sent to the specialist, the date determined, the determiner, and the insect's correct scientific name. Figure 5 is an example of a species determination card that has not been completely filled out. The last entries on the species determination card are not made until the determined specimens come back from the specialist, and a memorandum listing the determinations is received.

Figure 5.--Example of species determination card (incomplete)

Hopk. U.S. <u>30344-A</u>		
<u>Pseudotsuga taxifolia</u>		
Enumclaw, Wash.	July 28, 1959	P. W. Orr, Col'r.
30344-A <u>Dendroctonus</u> sp. (No.) pinned specimens sent to Washington for identification (<u>Date</u>); returned (<u>Date</u>).		
Det.: (Scientific name)		
Det.by: (Name of specialist) (Date of memo)		

Host Index

The host index does two things: One, it lists all Hopkins collections from a particular host; and two, it serves as a record of insect-host associations. The index is arranged alphabetically by host. Most hosts are plant species and are identified by their scientific names; however, there is one "miscellaneous" listing which records insects taken in flight, on dead porcupines, up trouser legs, etc. The host index has two distinct sections behind each host reference: (1) a number summary section and (2) an insect summary section. The number summary card is a running list of all the collections made on a specific host. Data recorded include the Hopkins number, the locality of collection, the collection date, and the initials of the collector. Only one entry is made per Hopkins number, regardless of how many insect species were collected. Figure 6 is an example of the data arrangement on the number summary card.

Figure 6.--Example of number summary card in host index

PICEA SITCHENSIS		
18166 - Astoria, Ore.	2/27/30	WJB
18176 - Oregon City, Ore.	5/ 2/30	FPK
33244 - Seaside, Ore.	5/25/53	KHW

Figure 6 shows how many collections have been made on Sitka spruce in the last 30 years and where they were made. It does not show the insect species collected. That information is derived from the insect summary card.

The insect summary cards in the host index record all insect species that have, at one time or another, been found associated with a particular plant host. Parasites are included as well as phytophagous insects. In this case, the parasite's host is recorded as that of the parasitized phytophagous insect. The several cards in this section are arranged alphabetically behind the host reference according to insect Order and Family. Under the Family name, there is usually a list of several insect scientific names. The name of a particular insect species is entered only once on this card, regardless of how many times it is collected on a host. Thus, this portion of the host index is simply a historical record of insect-host association. It will not reveal abundance. Figure 7 shows what information is needed on the second host index card and how it is arranged.

Figure 7.--Example of insect summary card in the host index

PINUS CONTORTA		COLEOPTERA		
		<u>Locality</u>	<u>Col'r.</u>	<u>Det.by</u>
Scolytidae				
	<u>Dendroctonus brevicomis</u>	Ore.	FPK	WPA
	<u>Hylurgops lecontei</u>	Ore.	WJB	REA
	<u>Ips concinnus</u>	Ore.	FPK	NUT

Figure 7 should not confuse one into thinking that a single notation will always fulfill the requirements of this file. If several insect species were taken in one collection, the card for each family represented should be checked to see if the species has been recorded. For instance, if three insect species from three families were reared from lodgepole pine, the specific determinations might have to be noted on three different cards behind the Pinus contorta listing.

Insect Species File

This file shows collection locality and collection frequency of insect species on different hosts. Frequency of collection, however, is only an indication but not a reliable measure of host preference; insects on unusual hosts are apt to be recorded more consistently than those associated with common hosts. Perhaps the most valuable data to be derived from this file is information on insect host selection and geographic distribution.

The insect species file has two sections--one for phytophagous insects and one for parasites. No provisions are made for predators. In both sections, cards are arranged alphabetically according to the scientific names of insects. Then, for each insect, there may be several more cards--one card for each host on which the insect was collected. For example, if spruce budworm has been collected from Douglas-fir, white fir, and larch, there will be three cards for Choristoneura fumiferana.

Each card shows a running list of Hopkins collections made over several years; each entry consists of a specific Hopkins number with a letter suffix, the collection locality, the date of the collection, and the collector's initials. Figure 8 presents an example of the phytophagous insect card.

Figure 8.--Example of phytophagous insect card in the insect species file.

<u>CHORISTONEURA FUMIFERANA (CLEM.)</u>			LEPIDOPTERA Tortricidae	
<u>Pseudotsuga taxifolia</u>			<u>Col'r.</u>	<u>Det.by</u>
12517-B	Ashland, Ore.	5/15/14	JMM	CH
18158-F	Northport, Wn.	7/18/29	FPK	FPK
31865-A	Heppner, Ore.	9/ 3/44	WJB, RLF	RLF
33313-A	Cottage Grove, Ore.	5/25/49	KHW	RLF

An entry is made in the insect species file for each species in a collection, regardless of whether it has been previously recorded. For example, a foliage sample from Douglas-fir may be infested with a caterpillar, a sawfly, and an aphid. Thus there would be entries on three different cards for the one collection.

The format in the parasite section of the insect species file is similar to that noted in figure 5 for the phytophagous insect cards. The only difference is that the name of the parasitized host is added to the parasite card. Figure 9 shows a typical parasite card.

Figure 9.--Example of parasite card from the insect species file

<u>APANTELES FUMIFERANAE</u> VIER.			HYMENOPTERA Braconidae	
<u>Pseudotsuga taxifolia</u>				
Ex.	<u>Choristoneura fumiferana</u>		<u>Col'r.</u>	<u>Det.by</u>
33313-F	Cottage Grove, Ore.	5/25/49	KHW	VMC
33331-C	Joseph, Ore.	7/29/55	WKC	WKC

The insect species file is the first place to investigate for information on specific insects. In this file, collecting frequency, geographic distribution, and host range can be found for each insect species. Then, armed with Hopkins numbers, the investigator can proceed to the number file for pertinent collection data, rearing techniques, information about associated insects, etc.

SEQUENCE OF EVENTS IN COLLECTING, PROCESSING, AND FILING INSECTS FOR SUBSEQUENT DETERMINATION

This section presents the procedures one follows from the time insect material is collected until identifications are obtained. To simplify procedure, the sequence of jobs is presented as a check list in one, two, three order. The check list follows:

1. Collect insects or infested material, keeping insects separated by host.
2. Rear insects from infested host material or, in the case of defoliators, on fresh host material. When insects are collected as adults, rearing may not be necessary. (At times mating of insects and egg-laying may be desired to obtain needed biological information).

3. If the rearing or collecting results are of interest, assign a Hopkins number to the collection. (A single Hopkins number can not be assigned to insects collected from more than one host species, or to insects of the same host species when the collections are separated appreciably by time, space, or host condition).
4. Fill out general note card (fig.1) in the number file after preparing and editing a rough draft. The information should be typed on the card stamped with the Hopkins number.
5. If the insects were reared, fill out rearing notes summary card (fig.2).
6. Fill out, if needed, species note card (fig.3).
7. Separate insects by order and family. By microscopic examination decide how many species are represented.
8. Assign a "letter" suffix to the Hopkins number for each tentative identification and fill out species summary card (fig.4).
9. Label insects (including a suffixed Hopkins number label) and place specimens in a Schmidt box in order of Hopkins number. Later, the insects to be identified will be removed and sent to a specialist. The duplicates retained at the Station are labeled with a blue tag to show that specimens have been sent away.
10. Make out three copies of the species determination card for each insect species being sent away for identification (fig.5).
11. Write a covering memo for the insects to be shipped. One white copy is prepared for the Division Chief in Washington, D.C. in addition to the copy for the Station files.
12. Type six copies of the insect identification slip (Appendix A.)
13. Attach two copies of each species determination card (step #10) and three copies of the insect identification slip (step #12) to the covering memo going to the specialist (usually through A.R.S. Division of Identification and Parasite Introduction). Mail memo.
14. Attach one insect identification slip (step #12) to the covering memo going to the W.O. This goes with other mail to the Chief, U.S.F.S.

15. Attach one insect identification slip (step #12) to the file copy of the covering memo and place in the pending file (4500-4).
16. Place one insect identification slip (step #12) in the shipping box and mail specimens to the specialist for identification.
17. Clip (use paper clip) all file copies of species determination cards together and place in pending section at the back of the number file. Place the other cards in the proper place in the number file.
18. When identified insects are returned, hold them in the mailing box until determination labels are made and attached (individually in the case of pinned specimens). While a full-size determination label is used for the first specimen in a series, abbreviated labels are often used for the remaining specimens. Place both the determined specimens and the retained duplicates in the Station museum collection. Do not place determination labels on specimens not actually seen by a specialist.
19. Complete species determination card (step #10) and enter determination on lines in species summary card opposite proper alphabetical letter.
20. Fill out both cards in the host index (figures 6 and 7) and file in proper place. Place one red dot opposite determination on determination card. (The red dot signifies that the host indexing has been completed).
21. Fill out card(s) (more than one card may need attention) in the insect species file (figure 8 and/or figure 9) and return cards to the file. Place second red dot on determination card. (The second red dot shows that the species indexing was done).
22. If all insects under a collection number have been determined, the paper clip is removed from the number file cards to show that processing is completed. Cards are then stapled together and filed in their proper numerical place.
23. Remove covering memo from the pending file (step #15) and join with letter of transmittal received with the return of the identified specimens. Return the joined copies to file 4500-4 and place in folder marked with the year that the insects were identified.

In most cases completion of the above 23 steps should fulfill the requirements of the Hopkins system. The various files discussed in the first part of this paper should also be read carefully; an understanding of the three main Hopkins files will ease the task of obtaining identifications and will certainly facilitate insect record research.

APPENDIX A

ENT-247
(12-84)

U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ENTOMOLOGY RESEARCH DIVISION

INSECT IDENTIFICATION SLIP

The following two lots of parasitic insects are submitted for determination:

HYMENOPTERA

Parasites reared from Argyrotaenia dorsalana, Malacosoma pluviale, Recurvaria probably milleri, and Griselda radicana under Hopkins numbers 33320, 33322, 33318, & 33365.

One stray unidentified specimen from an old rearing of ponderosa pine, under 18954.

DIPTERA

Parasites reared from Malacosoma pluviale & Hyphantria sp. under Hopkins numbers 33322 & 33354.

One stray specimen from rearing of Hemerocampa pseudotsugata under Hopkins number 18182.

Div. of Forest Insect Research
PNW Forest & Range Expt. Station
P. O. Box 4059
Portland 8, Ore.